

WHAT IS CLAIMED IS:

1. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of a protective antigen component from a clostridial organism, a protective antigen component from a non-clostridial organism and an adjuvant, wherein the vaccine is in a low dose volume.
2. A multicomponent vaccine comprising a safe and immunogenically effective combination of protective antigen components from clostridial organisms, a protective antigen component from a non-clostridial organism and an adjuvant, wherein the vaccine is in a low dose volume.
3. The vaccine according to Claim 1 wherein the clostridial organism is selected from the group consisting of Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl perfringens type D, Cl. sordellii, Cl. haemolyticum and Cl. tetani.
4. The vaccine according to Claim 1 wherein said non-clostridial organism is selected from the group consisting of a Gram negative bacteria, a Gram positive bacteria, a virus, a parasite and a rickettsia.
5. The vaccine according to Claim 4 wherein the Gram negative organism is selected from the group consisting of H. somnus, M. bovis, P. haemolytica, P. multocida, E. coli, S. typhimurium, Leptospira spp. and C. foetus.
6. The vaccine according to Claim 5 wherein the Gram negative organism is H. somnus.
7. The vaccine according to Claim 5 wherein the Gram negative organism is M. bovis.
8. The vaccine according to Claim 4 wherein the virus is selected from the group consisting of infections bovine rhinotracheitis

virus, bovine virus diarrhea virus, parainfluenza type 3 virus, bovine respiratory syncytial virus and a combination thereof.

9. The vaccine according to Claim 4 wherein the parasite is selected from the group consisting of Neospora spp., Tritrichomonas foetus and Cryptosporidium bovis.
10. The clostridial vaccine according to Claim 1 wherein the protective antigen component of the clostridial or non-clostridial organism is derived from a member selected from the group consisting of a whole bacterial culture, a whole virus culture, a cell-free toxoid, a purified toxoid and a subunit.
11. The vaccine according to Claim 1 wherein the adjuvant is selected from the group consisting of a polymer, a block co-polymer, an oil-in-water, a water-in-oil, Al(OH)_3 , AlPO_4 , an extract of a bacterial cell wall, an extract of a plant, a liposome, Quil A and a combination thereof.
12. The vaccine according to Claim 1 wherein the adjuvant is a polymer or a block co-polymer.
13. The vaccine according to Claim 12 wherein the polymer is a modified carbopol.
14. The vaccine according to Claim 1 wherein the protective antigen component is derived from 6 clostridial organisms.
15. The vaccine according to Claim 14 wherein the 6 clostridial organisms are selected from the group consisting of Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens type D, Cl. haemolyticum and Cl. sordellii.
16. The vaccine according to Claim 1 wherein the protective antigen component of the clostridial organism is derived from 7 clostridial organisms.
17. The vaccine according to Claim 16 wherein the 7 clostridial organisms are selected from the group consisting of Cl. chauvoei, Cl.

septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens type D, Cl. sordellii, Cl. ha molyticum, and Cl. tetani.

18. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of a protective antigen component from 6 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens, type D, and Cl. sordellii; a protective antigen component from a non-clostridial organism which is H. somnus and an adjuvant, wherein the vaccine is in a low dose volume.
19. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of an antigen component from 7 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens, type D, and Cl. sordellii; a protective antigen component from a non-clostridial organism which is H. somnus and an adjuvant, wherein the vaccine is in a low dose volume.
20. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of a protective antigen component from 6 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens, type D, and Cl. sordellii; a protective antigen component from a non- clostridial organism which is M. bovis and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.
21. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of a protective antigen component from 7 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens, type D, and Cl. sordellii; a protective antigen component from a non- clostridial organism which is M. bovis and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.

22. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of protective antigen components from a clostridial organism; a protective antigen component from a virus and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.
23. A multicomponent vaccine for ruminants comprising a safe and immunogenically effective combination of protective antigen components from a plurality of clostridial organisms, a protective antigen component from a plurality of viruses and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.
24. The vaccine according to Claim 23 wherein the clostridial organism is selected from the group consisting of Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens, type D, Cl. sordellii, Cl. haemolyticum, and Cl. tetani.
25. The vaccine according to Claim 23 wherein the viruses are selected from the group consisting of infectious bovine rhinotracheitis, parainfluenza type 3 virus, bovine virus diarrhea virus and bovine respiratory syncytial virus.
26. The vaccine according to Claim 23 wherein the adjuvant is selected from the group consisting of a polymer, a block co-polymer, an oil-in-water, a water-in-oil, an extract of a plant and a combination thereof.
27. The vaccine according to Claim 23 wherein the clostridial organisms are selected from the group consisting of Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens, type D, Cl. sordellii, Cl. haemolyticum, and Cl. tetani.
28. The vaccine according to Claim 23 wherein the non-clostridial organism is selected from the group consisting of a Gram negative bacteria, a Gram positive bacteria, a virus, a parasite and a rickettsia.

29. The vaccine according to Claim 28 wherein said Gram negative organism is selected from the group consisting of H. somnus, M. bovis, P. haemolytica, P. multocida, E. coli, S. typhimurium, Leptospira spp. and C. foetus.
30. The vaccine according to Claim 28 wherein the virus is selected from the group consisting of infectious bovine rhinotracheitis, parainfluenza type 3 virus, bovine virus diarrhea virus and bovine respiratory syncytial virus.
31. The vaccine according to Claim 28 wherein the parasite is selected from the group consisting of Neospora spp., Tritrichomonas foetus and Cryptosporidium spp.
32. The vaccine of Claim 2 wherein the protective antigen is derived from a member selected from the group consisting of whole bacterial culture, a whole virus culture, a cell-free toxoid, a purified toxoid and a subunit.
33. The vaccine according to Claim 28 wherein the adjuvant is selected from the group consisting of a polymer, a block polymer, an oil-in-water, a water-in-oil, an extract of a plant, a liposome and a combination thereof.
34. The vaccine according to Claim 2 wherein the adjuvant is carbopol.
35. The vaccine according to Claim 2 wherein the protective antigen component of the clostridial organisms are derived from 6 clostridial organisms.
36. The vaccine according to Claim 2 wherein the 6 clostridial organisms are selected from the group consisting of Clostridium chauvoei, Clostridium septicum, Clostridium novyi, Clostridium perfringens type C, Clostridium perfringens type D, Clostridium sordellii and Clostridium haemolyticum.

37. The vaccine according to Claim 2 wherein the protective antigen components of the clostridial organisms are derived from 7 clostridial organisms.
38. The vaccine according to Claim 37 wherein the 7 clostridial organisms are selected from the group consisting of Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens type D, Cl. sordellii, Cl. haemolyticum and Cl. tetani.
39. A multicomponent vaccine comprising a safe and immunogenically effective combination of a protective antigen component from 6 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens type D and Cl. sordellii; a protective antigen component from H. somnus or M. bovis and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.
40. A multicomponent vaccine comprising a safe and immunogenically effective combination of a protective antigen component from 7 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens type D, Cl. sordellii and Cl. haemolyticum; a protective antigen component from H. somnus or M. bovis and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.
41. A multicomponent vaccine comprising a safe and immunogenically effective combination of a protective antigen component from 2 clostridial organisms which are selected from the group consisting of Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens type C, Cl. perfringens type D, Cl. sordellii, Cl. haemolyticum and Cl. tetani; a protective antigen component from viruses which are selected from the group consisting of infectious bovine rhinotracheitis virus, parainfluenza type 3 virus, bovine virus diarrhea virus and bovine respiratory syncytial virus and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.

42. A multicomponent vaccine comprising a safe and immunogenically effective combination of a protective antigen component from 6 clostridial organisms which are Cl. chauvoei, Cl. septicum, Cl novyi, Cl. perfringens type C, Cl. perfringens type D and Cl. sordellii; a protective antigen component from 4 viruses which are infectious bovine rhinotracheitis virus, parainfluenza type 3 virus, bovine virus diarrhea virus and bovine respiratory syncytial virus and an adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less.
43. A method of preparing a multicomponent vaccine comprising a safe and immunogenically effective combination of a protective antigen component from clostridial organisms and a protective antigen component from a non-clostridial organism, and ad adjuvant, wherein the vaccine is in a dose size of 3.0 mL or less, said method comprising the steps of:
- i) identifying the protective antigen component of each of the organisms by in vivo or in vitro methods,
 - ii) quantitating the protective antigen components using antigen quantitation assays to provide the protective antigen component in an amount sufficient to provide a protective vaccine with the least antigenic mass
 - iii) identifying components of the organisms containing detrimental antigens by using the antigen quantitation assays and animal reaction testing,
 - iv) purifying the protective antigen components which contain detrimental antigens to remove the detrimental antigens,
 - v) selecting for each organism requiring inactivation, an effective inactivating agent which kills the organism without denaturing the protective antigen component,

vi) selecting an effective adjuvant for each antigen component which enhances immune response without causing unacceptable animal reaction,

vii) individually adjuvanting the protective antigen components which requires such individual adjuvanting, and

viii) pooling all protective antigen components into a serial.

44. A method of administering the vaccine of Claim 1 to a ruminant comprising intramuscularly or subcutaneously vaccinating the ruminant.

45. A method of administering the vaccine of Claim 2 to a ruminant comprising intramuscularly or subcutaneously vaccinating the ruminant.